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**Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals**

**Sub-Committee of Experts on the Transport of Dangerous Goods**

**Fifty-third session**
Geneva, 25 June-4 July 2018
Item 10 (d) of the provisional agenda
**Issues relating to the Globally Harmonized System of Classification and Labelling of Chemicals: use of the Manual of Tests and Criteria in the context of the GHS**

**Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals**

**Thirty-fifth session**
Geneva, 4-6 July 2018
Item 2 of the provisional agenda
**Joint work with the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee)**

# Use of the Manual of Tests and Criteria in the context of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

## Transmitted by the Chairman of the Working Group on Explosives of the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee) on behalf of the Working Group*

1. This document contains the proposed list of amendments to Sections 1 and 10 of the sixth revised edition of the Manual of Tests and Criteria, including Amendment 1, to take account of its use in the context of the GHS, for consideration by both sub-committees.

2. For practical reasons, the text of sections 1 and 10 of the Manual of Tests and Criteria with the proposed changes in visible mode is circulated separately, in English only, in informal document INF.3.

* In accordance with the programme of work of the Sub-Committee for 2017–2018 approved by the Committee at its eighth session (see ST/SG/AC.10/C.3/100, paragraph 98 and ST/SG/AC.10/44, para. 14).

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## General table of contents

PART I: Delete "OF CLASS 1" at the end.

12. TEST SERIES 2: Replace "for inclusion in Class 1" with "for inclusion into the class of explosives".

13. TEST SERIES 3: Amend the sentence between parentheses to read: "(To determine if a substance is an unstable explosive in the form it was tested)".

14. TEST SERIES 4: At the end, after "too dangerous for transport" add "… and classified as a GHS unstable explosive".

16. TEST SERIES 6: Replace "Class 1" with "the class of explosives".

18. TEST SERIES 8: Replace "for inclusion in Division 5.1," with "for classification as an oxidizing substance" and "suitability for transport" with "suitability for containment".

PART II: Replace "SELF-REACTIVE SUBSTANCES OF DIVISIONS 4.1 ADN ORGANIC PEROXIDES OF DIVISION 5.2" with "SELF-REACTIVE SUBSTANCES, ORGANIC PEROXIDES AND POLYMERIZING SUBSTANCES".

PART III: Add a new section 39 at the end, to read as follows:

"39. CLASSIFICATION PROCEDURE AND CRITERIA RELATING TO SOLID AMMONIUM NITRATE BASED FERTILIZERS".

## Section 1

1.1.1 Amend to read as follows:

"The purpose of the Manual of Tests and Criteria (hereafter referred to as the "Manual") is to present the United Nations schemes for the classification of dangerous goods subject to transport regulations and hazardous substances and mixtures in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals and to give descriptions of the test methods and procedures considered to be the most useful for providing competent authorities and manufacturers and suppliers with the necessary information to arrive at a proper classification.".

1.1.2 Current paragraph 1.1.2 becomes new paragraph 1.1.7.

Insert a new paragraph to 1.1.2 to read as follows:

"1.1.2 This Manual should be used in conjunction with the latest versions of:

(a) the Recommendations on the Transport of Dangerous Goods (hereafter referred to as the Recommendations) and the Model Regulations annexed thereto (hereafter referred to as the Model Regulations) and;

(b) the Globally Harmonized System of Classification and Labelling of Chemicals (hereafter referred to as the GHS).".

1.1.3 Current paragraph 1.1.3 becomes new paragraph 1.1.8.

1.1.3 to 1.1.6 Insert the following new paragraphs:

"1.1.3 Definitions of terms used in the Manual may be found in Chapter 1.2 and Annex B of the Model Regulations and in the GHS. The term substance as it is used in this Manual includes substances, mixtures and solutions, unless otherwise stated.

1.1.4 The test methods and criteria in this Manual were originally developed to address classification for transport purposes, and therefore in previous editions of the Manual (up to the 7th revised edition) frequent reference is made to "as packaged for transport". As for physical hazards the GHS refers to the tests contained in this Manual, to facilitate its use in the context of the GHS (i.e.: in sectors other than transport), the phrase "as offered for classification" is now used instead when appropriate. For example, if the classification to be determined is for products as packaged for transport, "as offered for classification" means "as offered for transport". On the other hand, if the classification to be determined is for sectors other than transport in the context of the GHS, then "as offered for classification" means "in the condition relevant to the particular application, e.g. supply and use". More details on the reasons for this change are provided below.

1.1.5 The outcome of the tests in this Manual is predominantly related to the intrinsic properties of the substance being tested. However the test results may also be affected by other physical parameters such as: density; particle size (distribution) and humidity. For some physical hazards the outcome of the tests and hence the classification can also be dependent on the quantity of the sample and the packaging.

1.1.6 For these reasons, the above mentioned parameters and circumstances should be taken into account when considering test results, particularly for classification for sectors other than transport.".

1.1.7 (new, former 1.1.2) In the first sentence, delete "of Tests and Criteria" and "of products". Amend the beginning of the third sentence to read: "Where appropriate, the competent authority...".

1.1.8 (new, former 1.1.3) Delete "or Divisions for transport" and replace "Competent Authority" with "competent authority" and "Competent Authorities" with "competent authorities".

1.1.9 Insert a new paragraph 1.1.9 to read as follows:

"1.1.9 The text and references throughout the manual strive to be sector-neutral, but sometimes must be sector-specific. For example, Part IV is used for transport equipment, and Part V is used for sectors other than transport. Also, there is some sector-specificity within Parts I and II describing tests with packages as presented for transport. Explosives transport classifications to the Division level frequently apply only to a defined configuration, with the quantity and confinement (packaging) as prepared for transport. Sectors other than transport may build upon explosives transport classifications.".

1.2 Current section 1.2 becomes new section 1.3.

Insert a new section 1.2 to read as follows:

"**1.2 Hazard classes in the Model Regulations and in the GHS**

**1.2.1** ***Hazard classes in the Model Regulations***

1.2.1.1 Substances and articles subject to the Model Regulations are assigned to one of nine classes according to the hazard or the predominant hazard they present for transport. Some of these classes are subdivided into divisions addressing a more specific type of hazard within a given class. The numerical order of the classes and divisions does not reflect the degree of hazard.

1.2.1.2 In addition, for packing purposes, some dangerous goods are assigned to one of three packing groups in accordance with the degree of hazard they present:

Packing group I: high hazard
Packing group II: medium hazard
Packing group III: low hazard

The packing group to which a substance is assigned is indicated in the Dangerous Goods List in Chapter 3.2 of the Model Regulations. Articles are not assigned to packing groups.

1.2.1.3 Dangerous goods meeting the criteria of more than one hazard class or division and which are not listed in the Dangerous Goods List are assigned to a transport class and division and subsidiary hazard(s) on the basis of the precedence of hazards characteristics.

1.2.1.4 *Precedence of hazard characteristics for transport purposes*

1.2.1.4.1 The precedence of hazard characteristics table in 2.0.3.3 of Chapter 2.0 of the Model Regulations may be used as a guide in determining the class of a substance having more than one hazard, when it is not named in the Dangerous Goods List in Chapter 3.2 of the Model Regulations. For goods having multiple hazards, which are not specifically listed by name in the Dangerous Goods List, the most stringent packing group denoted to the respective hazard of the goods takes precedence over other packing groups, irrespective of the precedence of hazard characteristics table.

1.2.1.4.2 The precedence of hazard characteristics of the following are not dealt with in the Precedence of hazard table in Chapter 2.0 of the Model Regulations, since these primary characteristics always take precedence:

- Substances and articles of Class 1;
- Gases of Class 2;
- Liquid desensitized explosives of Class 3;
- Self-reactive substances and solid desensitized explosives of Division 4.1;
- Pyrophoric substances of Division 4.2;
- Substances of Division 5.2;
- Substances of Division 6.1 with a packing group I inhalation toxicity;
- Substances of Division 6.2; and

- Radioactive material of Class 7.

1.2.1.4.3 Self-reactive substances, except for type G, giving a positive result in the self-heating test N.4, should not be classified as pyrophoric liquids or solids but as self-reactive substances (see Chapter 2.4, paragraph 2.4.2.3.1.1 of the Model Regulations). Organic peroxides of type G having properties of another hazard class (e.g. UN No. 3149) should be classified according to the requirements of that hazard class.

### 1.2.2 Hazard classes in the GHS

The GHS addresses classification of substances by types of chemical hazards (e.g. flammability, toxicity, corrosivity) grouped into physical, health and environmental hazards. Each GHS hazard class corresponds to a type of hazard, and it is sometimes specific to a certain aggregation state (solid, liquid or gaseous). Most of the GHS hazard classes are further subdivided into hazard categories reflecting the severity of the hazard, with Category 1 indicating the most severe hazard.

### 1.2.3 Relationship between the Model Regulations and the GHS

1.2.3.1 Since the GHS addresses other sectors in addition to transport (e.g. storage, supply and use), it includes hazards not considered relevant to transport, such as several non-acute health hazards. Due to the differences in scope between the GHS and the Model Regulations not all hazards addressed in the GHS have their counterparts in the Model Regulations, and vice versa. For instance there is no specific hazard class in the GHS for radioactive material (Class 7 in transport) and some of the dangerous goods classified for transport in Class 9 are covered by other GHS hazard classes (e.g.: environmentally hazardous substances of Class 9 may fall under the GHS hazard class Hazardous to the aquatic environment).

1.2.3.2 In addition, while one transport class may cover several different types of hazards, GHS hazard classes usually address one type of hazard each. For instance, substances of Class 4 in transport belong to seven individual GHS hazard classes. Furthermore, while transport classes are identified by a number (1 to 9), GHS hazard classes are identified by a name reflecting the type of chemical hazard (e.g. "Flammable solids"). Moreover, the concept of precedence of hazards as defined in the Model Regulations (see 1.2.1.4) does not exist in the GHS.

1.2.3.3 The overarching correlation between GHS hazard classes and the transport classes addressed in the Model Regulations is indicated in Table 1.1. The table is indicative only and is not intended to be used as the sole basis in translating the classification of any substance or article between the GHS and the Model Regulations, or vice versa.

**TABLE 1.1: CORRELATION BETWEEN HAZARD CLASSES IN THE GHS AND IN THE MODEL REGULATIONS**

| Hazard classes in the GHS | Hazard classes in the Model Regulations |
|---|---|
| Explosives, Divisions 1.1 to 1.6 | Class 1, Divisions 1.1 to 1.6 |
| Flammable gases, Category 1 | Class 2, Division 2.1 |
| Aerosols | Class 2, Division 2.1 and 2.2 |
| Oxidizing gases | Class 2, Division 2.2 with subsidiary hazard 5.1 |
| Gases under pressure | Class 2 |
| Flammable liquids, category 1 to 3 | Class 3 |
| Flammable solids | Class 4, Division 4.1 |
| Self-reactive substances and mixtures | Class 4, Division 4.1 |
| Pyrophoric liquids | Class 4, Division 4.2 |
| Pyrophoric solids | Class 4, Division 4.2 |
| Self-heating substances and mixtures | Class 4, Division 4.2 |
| Substances and mixtures which, in contact with water, emit flammable gases | Class 4, Division 4.3 |
| Oxidizing liquids | Class 5, Division 5.1 |
| Oxidizing solids | Class 5, Division 5.1 |
| Organic peroxides | Class 5, Division 5.2 |
| Corrosive to metals | Class 8 |
| Desensitized explosives | Class 3 (liquids) |
| | Class 4, Division 4.1 (solids) |
| Acute toxicity, Categories 1, 2 and 3 | Class 6, Division 6.1 (solids and liquids) |
| | Class 2, Division 2.3 (gases) |
| Skin corrosion, Category 1 | Class 8 |
| Hazardous to the aquatic environment, Acute 1 and Chronic 1 and 2 | Class 9 (environmentally hazardous substances) |

"

1.3 Delete current section 1.3 ("Precedence of hazards characteristics").

Former heading of 1.2 becomes new 1.3. The text remains unchanged.

1.3.1 (new, former 1.2.1) Amend to read as follows:

"1.3.1 The Manual is divided into five parts:

Part I: relating to explosives;

Part II: relating to self-reactive substances and to organic peroxides;

Part III: relating to aerosols, desensitized explosives (relating to transport only), flammable liquids, flammable solids, pyrophoric liquids and solids, substances which in contact with water emit flammable gases, oxidizing liquids and solids, chemically unstable gases and gas mixtures, substances corrosive to metals, and substances and articles of transport Class 9 (ammonium nitrate fertilizers,

lithium metal and lithium ion batteries) and solid ammonium nitrate based fertilizers;

Part IV: test methods concerning transport equipment; and

Part V: classification procedures, test methods and criteria relating to sectors other than transport.".

The last paragraph of current 1.2.1 ("Part III …screening procedures" becomes new paragraph 1.3.2.

1.3.2 (new, former last paragraph of 1.2.1) Delete the first sentence ("Part III …Model Regulations").

Delete "a number of "before "appendices" and "the transport of" before "organic peroxides".

Amend the end of the paragraph to read as follows: "… self-reactive substances, on screening procedures, on flash compositions tests for the classification of fireworks, response descriptors and the ballistic energy test for cartridges, small arms.".

1.3.3 (new, former 1.2.2) Replace (twice) "Table 1.1" with "Table 1.2".

In the table, third row, under "Test Series", replace "L-T" with "C, L-U".

1.3.4 Former paragraph 1.2.3 becomes new paragraph 1.3.4. The text of the paragraph remains unchanged.

1.4.1 Amend the end of the paragraph to read as follows: "toxicity data (see Chapter 1.5 and Annex 4 of the GHS for guidance on the preparation of Safety Data Sheets).".

1.5.1 In the second sentence, replace "here" with "below". In the last sentence, after "those prescribed," insert "the deviation should be described and".

1.5.2 Amend the end of the first sentence and the beginning of the second sentence to read as follows: "…should be representative of the substances being classified. The contents of active substance(s)…".

1.5.4 Amend the end of the first sentence to read: "expected circumstances, e.g. of transport or storage.". In the second sentence replace "the transport conditions" with "these circumstances" and "anticipated transport conditions" with "anticipated conditions".

1.6.1 In the third sentence replace "Table 1.2" with "Table 1.3" and "Table 1.3" with "Table 1.4". In the last but one sentence, delete "as only one test is given for each property".

Current Table 1.2 becomes new Table 1.3, with the following changes:

- Amend the title to read "RECOMMENDED TESTS IN PART I".
- For the thermal stability test at 75 °C under "Test code" replace "3 (c)" with "3 (c) (i)".
- Insert a new row under the current row for Test series 7 (l), as follows:

| Test series | Test type | Test code | Test name |
|---|---|---|---|
| 7 | (l) | 7 (l) | 1.6 article (or component) fragment impact tests |

Amend the end of note "a" under the table to read as follows: "... suitability for containment in portable tanks as an oxidizing substance.".

Current Table 1.3 becomes new Table 1.4, with the following change: Amend the title to read "RECOMMENDED TESTS IN PART II".

1.7.1 Amend the beginning of the first sentence to read: "Classifications for inclusion in the list of dangerous goods for transport in...".

In the list under the introductory paragraph, replace "Substances and articles of Class 1" with "Explosive substances and articles" and delete "of Division 4.1" and "of Division 5.2".

## Part I

Part I In the title, delete "OF CLASS 1".

Table of contents In the title of section 10.4, replace "OF CLASS 1" with "OF THE CLASS OF EXPLOSIVES".

## Section 10

10.1.1 In the second sentence, after "the most useful for providing" delete "competent authorities with" and delete "for transport" at the end.

10.1.2 Amend to read as follows:

"The GHS class of explosives covers all sectors. Class 1 is a subset of this class and comprises explosives as presented for transport. The class of explosives also includes unstable explosives which are those explosives which are forbidden for transport. Goods of class 1 are assigned to one of the six divisions, depending on the type of hazard they present (see Chapter 2.1, paragraph 2.1.1.4 of the Model Regulations and Chapter 2.1, paragraph 2.1.2 of the GHS), and, for some regulatory purposes (e.g. transport), to one of the thirteen compatibility groups that identify the kinds of explosives that are deemed to be compatible. The general scheme for classifying a substance or article which is to be considered for inclusion in the class of explosives is illustrated in Figure 10.1. The assessment is in two stages. In the first stage, the potential of a substance or article to explode is ascertained and its chemical and physical stability and sensitivity are also determined. In order to promote uniform assessments by competent authorities, it is recommended that, using the flow chart in Figure 10.2, data from suitable tests is analysed systematically with respect to the appropriate test criteria. If the substance or article is provisionally accepted into the class of explosives, it is then necessary to proceed to the second stage and assign it to the correct division by use of the flow charts of in figures 10.3 and 10.5. With the exception of compatibility groups N and S, for which test data is necessary, assignment to a compatibility group, when appropriate, is usually made without reference to testing. In the case of compatibility group S, the tests may be waived (where appropriate by the competent authority) if classification by analogy is based on test results for a comparable article.".

10.1.3 Current paragraph 10.1.3 becomes new paragraph 10.1.4.

Insert the following new paragraph 10.1.3:

"10.1.3 Test Series 4 and 6 are performed as presented for transport. Explosives are unique in that the type of packaging and environment frequently have a decisive effect on the hazard and therefore on the assignment to a particular division (see Chapter 2.1 of the Model Regulations, introductory note 4). Additional considerations may therefore be necessary when transport classifications are used for other sectors.".

10.1.4 (new, former 10.1.3) Amend the end of the first sentence and the beginning of the second sentence to read as follows: "so that an appropriate classification can be assigned. When appropriate this is done by the competent authority.".

10.2.1 At the end of the first sentence, replace "Class 1" with "the class of explosives". In the second sentence delete "of Division 4.1" and "of Division 5.2". In the third sentence, insert "when appropriate" before "in the opinion".

In (a): Delete "or a combination or mixture of substances". Replace "combinations or mixtures" with "substances".

In (b): Delete "(see paragraph 2.1.1.5 of the Model Regulations)".

In (c): Delete "or a new combination or mixture of explosive substances".

In (d): Replace "risk" with "hazard" (twice).

Delete the last sentence following sub-paragraphs (a) to (d) ("The classification…for transport").

10.3.1.1 In the first sentence replace "Class 1" with "the class of explosives".

Amend the second sentence to read as follows: "This is decided by determining whether a substance provisionally accepted into the class of explosives is either too insensitive for inclusion in this class or is accepted as an unstable explosive (and considered too dangerous for transport); or whether article or packaged article are accepted as an unstable explosive (and considered too dangerous for transport).".

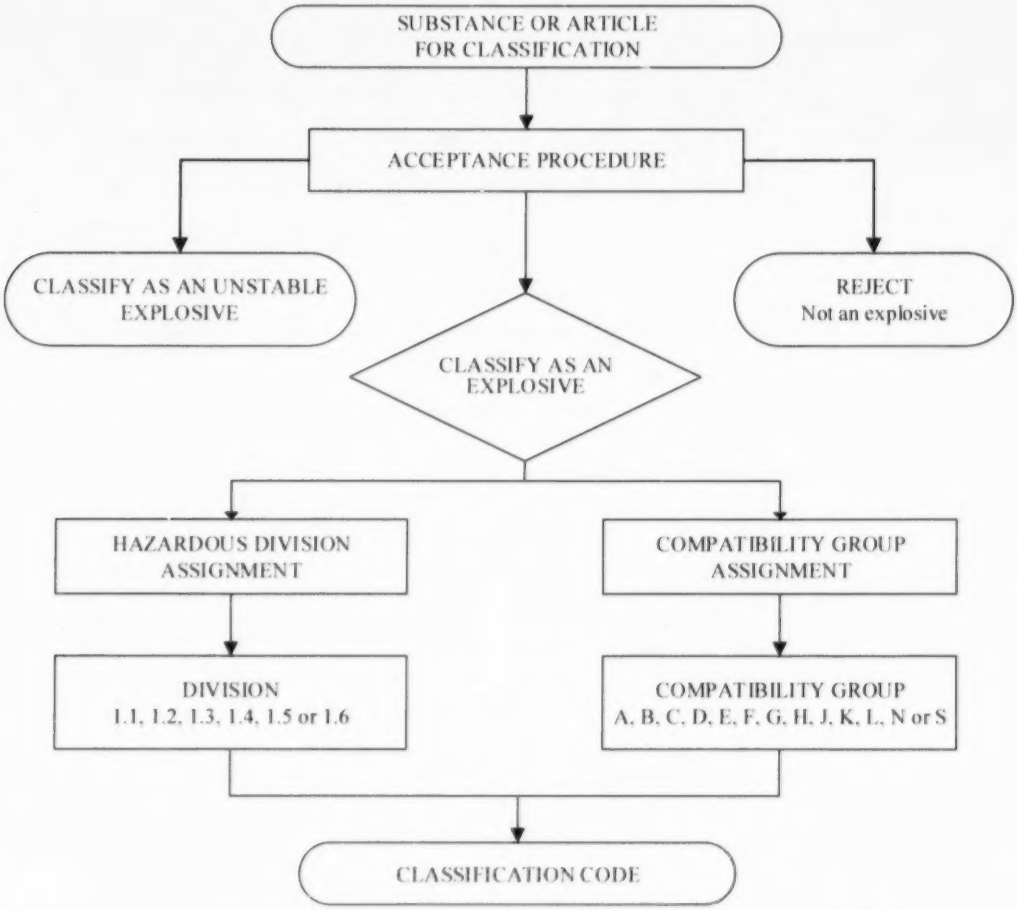
10.3.2.1 Replace "Class 1" with "the class of explosives". Replace "four series, numbered 1 to 4," by "four series (Test Series 1 to 4)".

10.3.2.2 Amend the beginning of the sentence to read: "The question "Does it have explosive properties?" (box 5, Figure 10.2) is answered".

10.3.2.3 Amend the first sentence to read as follows: "Series 2 tests are used to answer the question "Is it too insensitive for acceptance into this class?" (box 7, Figure 10.2).".

Figure 10.1 Replace the figure and its heading with the following:

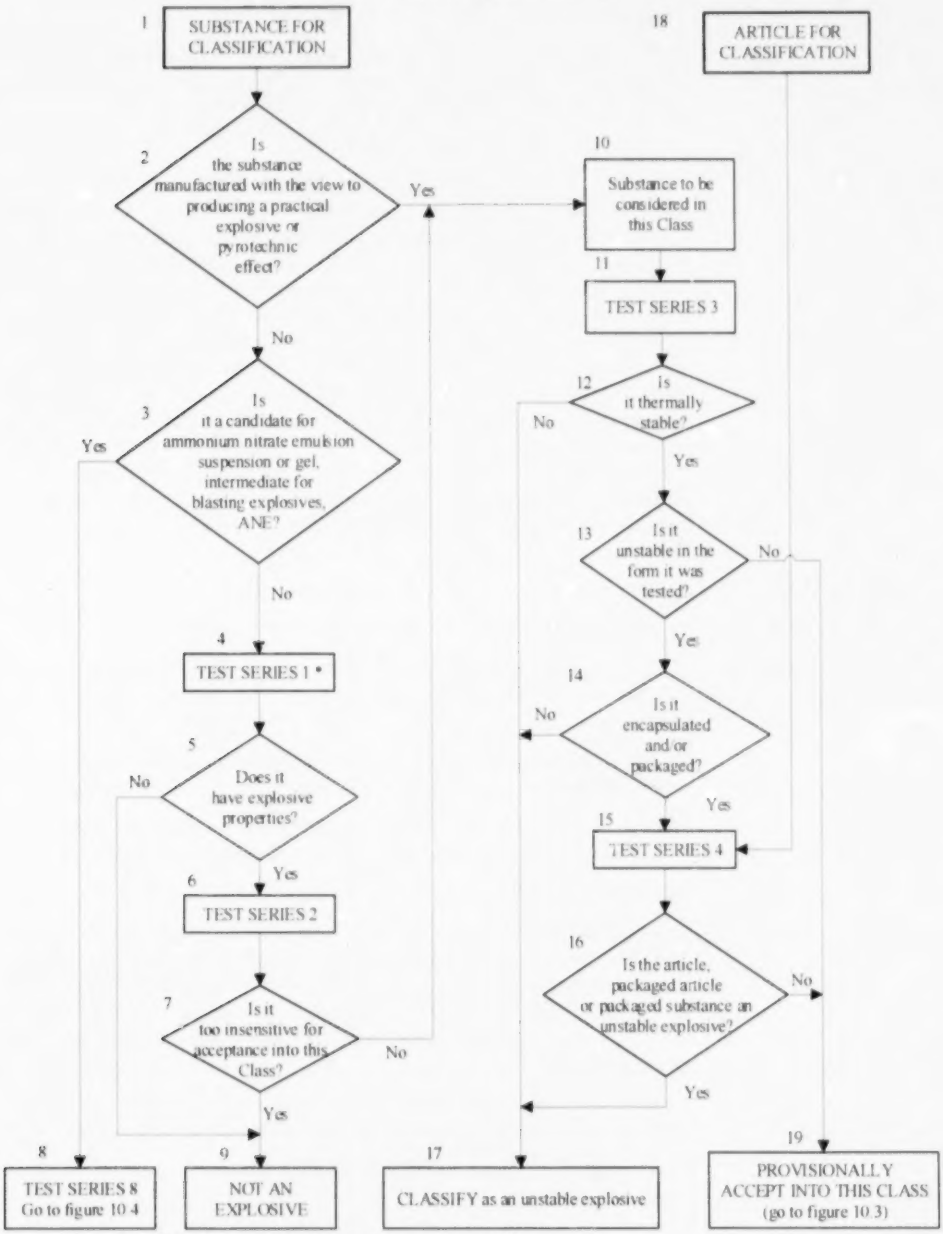
**"Figure 10.1:OVERALL SCHEME OF THE PROCEDURE FOR CLASSIFYING A SUBSTANCE OR ARTICLE IN THE CLASS OF EXPLOSIVES**


SUBSTANCE OR ARTICLE FOR CLASSIFICATION
ACCEPTANCE PROCEDURE
CLASSIFY AS AN UNSTABLE EXPLOSIVE
CLASSIFY AS AN EXPLOSIVE
REJECT Not an explosive
HAZARDOUS DIVISION ASSIGNMENT
COMPATIBILITY GROUP ASSIGNMENT
DIVISION 1.1, 1.2, 1.3, 1.4, 1.5 or 1.6
COMPATIBILITY GROUP A, B, C, D, E, F, G, H, J, K, L, N or S
CLASSIFICATION CODE

"

Figure 10.2 Replace current figure 10.2 and its heading with the following:

**"Figure 10.2: PROCEDURE FOR PROVISIONAL ACCEPTANCE OF A SUBSTANCE OR ARTICLE IN THE CLASS OF EXPLOSIVES**




* *For classification purposes start with test series 2"*

10.3.2.4 Amend the first sentence to read: "Test series 3 is used to answer the questions "Is it thermally stable?" (box 12, Figure 10.2) and "Is it unstable in the form it was tested?" (box 13, Figure 10.2).".

10.3.2.5 In the first sentence, replace "too dangerous for transport" with "an unstable explosive".

10.3.3.3 In the second sentence, insert ", where appropriate," after "authority". Amend the beginning of the last sentence to read: "If it is suspected (e.g. by the competent authority where appropriate), that the product…".

10.3.3.4 Amend the paragraph to read as follows:

"10.3.3.4 Test series 1 indicates whether a substance has explosive properties. However, for a new substance not designed to have a practical explosive or pyrotechnic effect, it is more appropriate to start the testing procedure with test series 3. Test Series 3 involves relatively small sample sizes, which reduces the risk to test personnel. If the substance passes test series 3, as a practical matter the next step is the application of test series 2 which determines whether the substance is too insensitive for inclusion into the class of explosives. There is no real need to perform test series 1 at this point. Substances which fail test series 2 but pass test series 3 shall be subjected to the procedure for assignment to the appropriate division of explosives. It is important to note, however, that a substance which fails test series 2 may still be excluded from the class of explosives provided the substance is not designed to have a practical explosive or pyrotechnic effect, nor exhibits any hazardous effects in test series 6 of the assignment procedure as packaged."

10.3.3.5 Insert "for testing purposes" after "control components,".

10.4 In the title replace "Class 1" with "the class of explosives".

10.4.1.1 Amend the beginning and the end of the first sentence to read as follows: "Unless classified as unstable, explosives are … Model Regulations and 2.1.2 of the GHS)."

In the second sentence, replace the text between brackets with "(figures 10.3 and 10.5)", replace "and/or" with "and", and "Class 1" with "this class".

Amend the beginning and the end of the third sentence to read as follows: "A substance or article is assigned to … to which it has been subjected.".

Amend the last sentence to read as follows:

"As indicated in box 39 of Figure 10.3, there is authority to exclude an article from the class of explosives by virtue of test results and the "explosives" definition (see paragraph 2.1.1.1 (b) of the Model Regulations and 2.1.1.2 (b) of the GHS). Specific criteria by which articles may be excluded from the class of explosives may be found in the Model Regulations (see paragraph 2.1.3.6.4). ".

10.4.2.1 In the first sentence replace the text between brackets to read "(Test Series 5 to 7)". In the last sentence, replace "national authority" with "classifier".

10.4.2.2 Replace "(box 21, Figure 10.3)" with "(box 28, Figure 10.3)".

Figure 10.3 Replace the figure and its heading with the following:

**"Figure 10.3: PROCEDURE FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES**

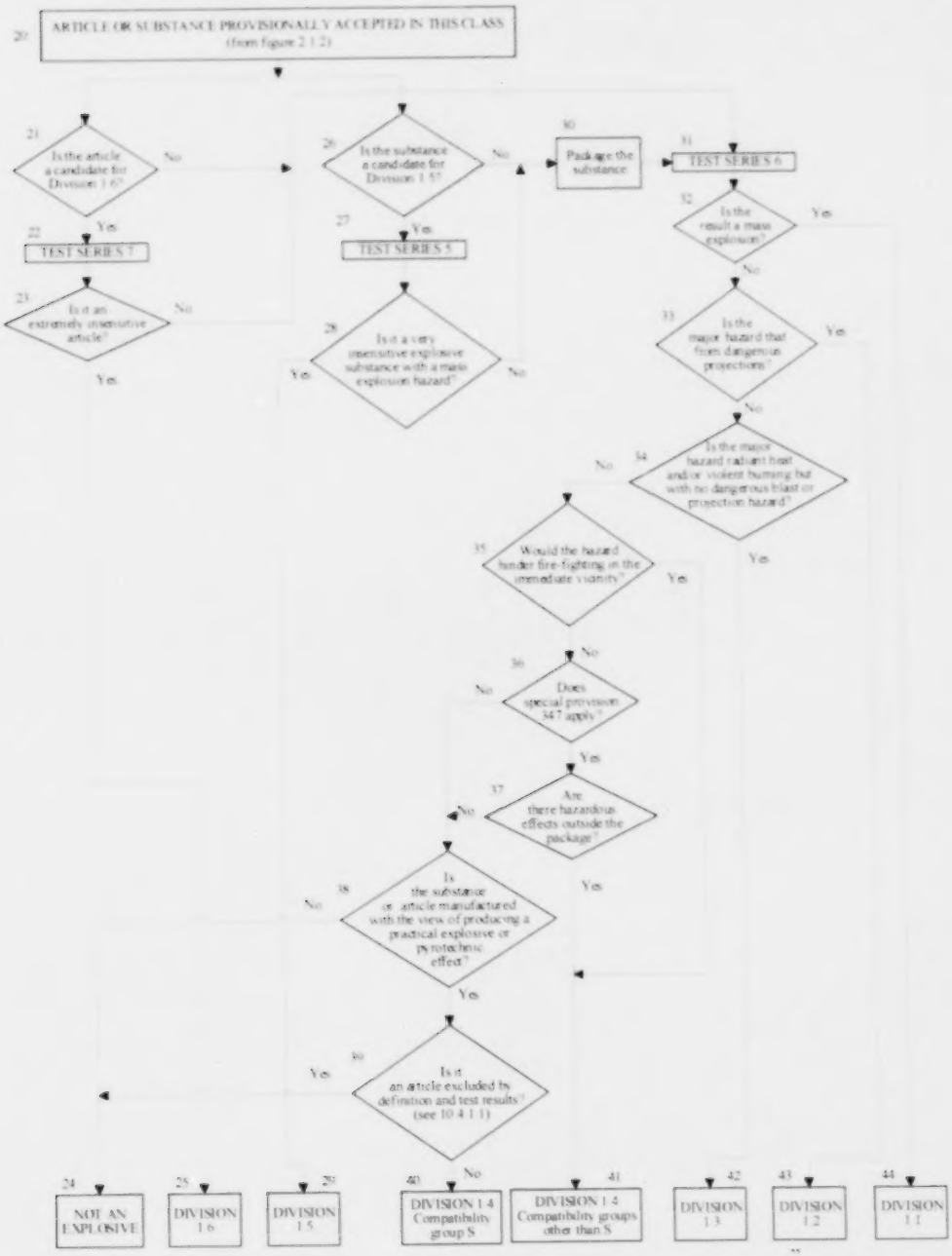
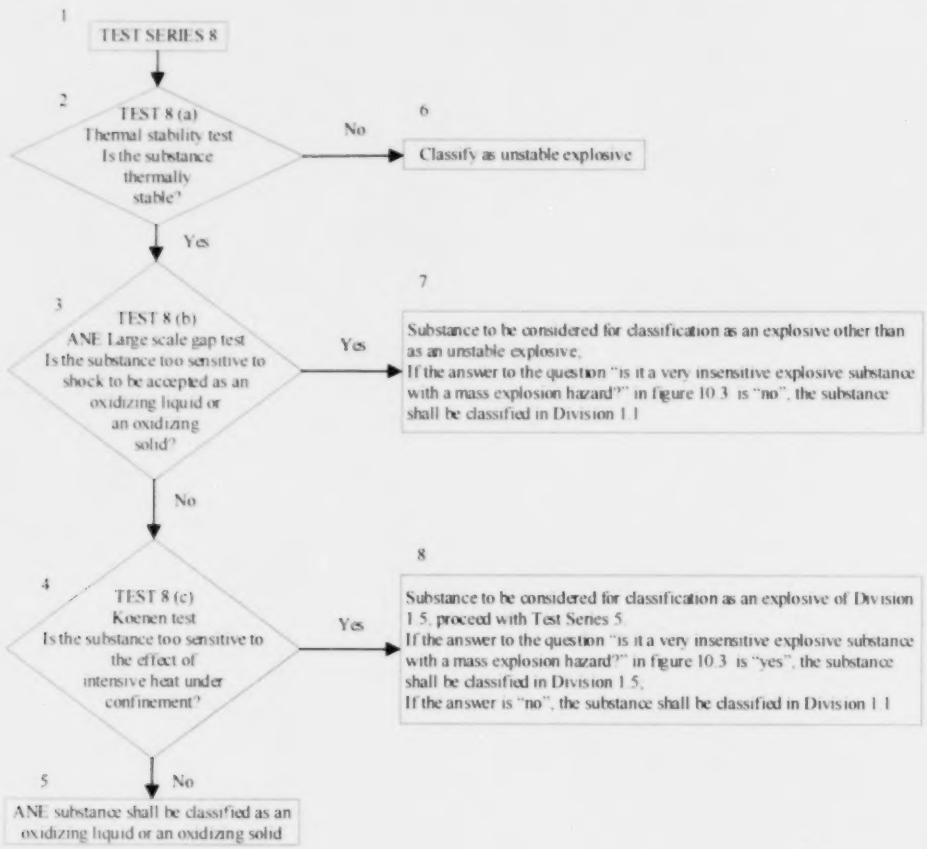

20 ARTICLE OR SUBSTANCE PROVISIONALLY ACCEPTED IN THIS CLASS (from figure 2.1.2)
21 Is the article a candidate for Division 1.6?
No
Yes
22 TEST SERIES 7
23 Is it an extremely insensitive article?
No
Yes
26 Is the substance a candidate for Division 1.5?
No
Yes
27 TEST SERIES 5
28 Is it a very insensitive explosive substance with a mass explosion hazard?
Yes
No
30 Package the substance
31 TEST SERIES 6
32 Is the result a mass explosion?
Yes
No
33 Is the major hazard that from dangerous projections?
Yes
No
34 Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard?
No
Yes
35 Would the hazard hinder fire-fighting in the immediate vicinity?
Yes
No
36 Does special provision 347 apply?
No
Yes
37 Are there hazardous effects outside the package?
No
Yes
38 Is the substance or article manufactured with the view of producing a practical explosive or pyrotechnic effect?
No
Yes
39 Is it an article excluded by definition and test results? (see 10.4.1.1)
Yes
No
24 NOT AN EXPLOSIVE
25 DIVISION 1.6
29 DIVISION 1.5
40 DIVISION 1.4 Compatibility group S
41 DIVISION 1.4 Compatibility groups other than S
42 DIVISION 1.3
43 DIVISION 1.2
44 DIVISION 1.1

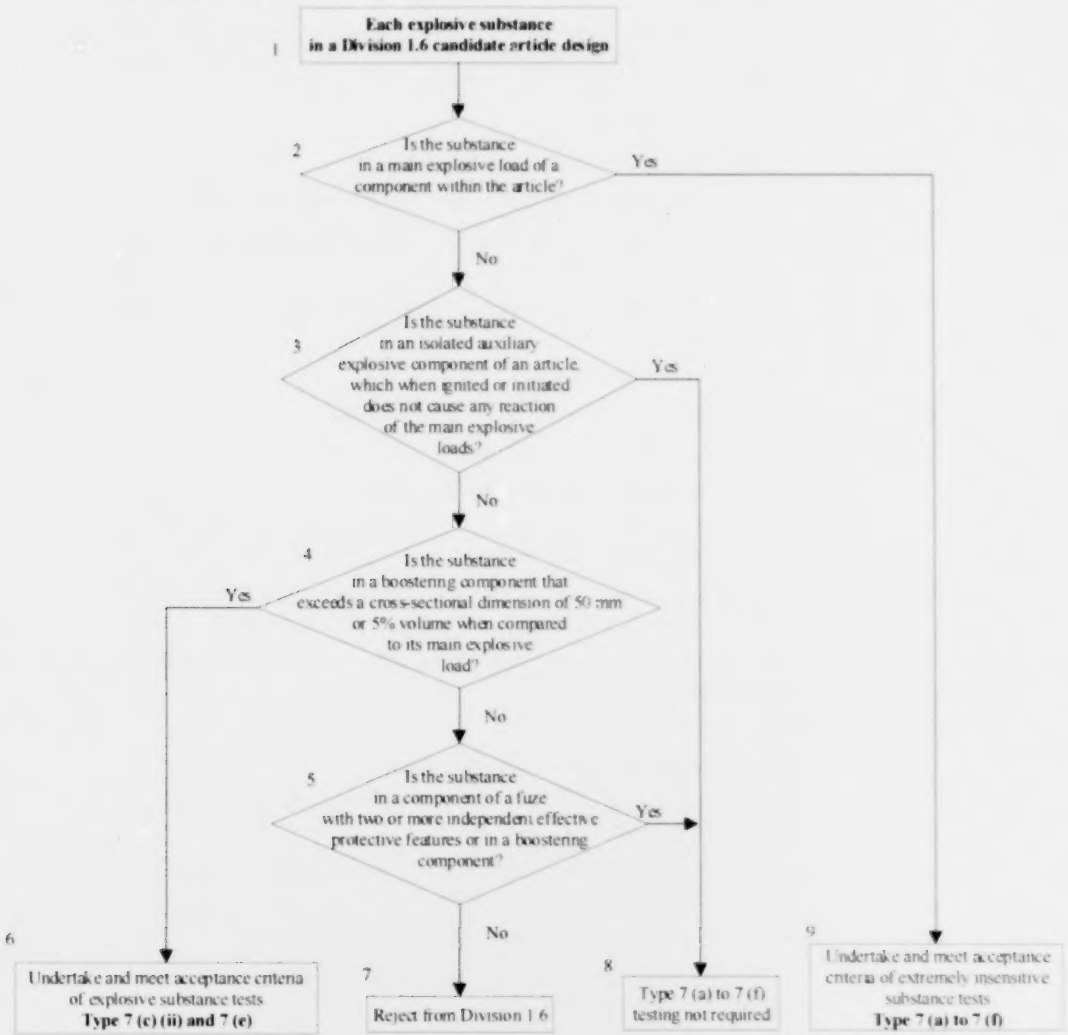
Figure 10.4 Replace current figure 10.4 with the following.

**"Figure 10.4: PROCEDURE FOR AMMONIUM NITRATE EMULSION, SUSPENSION OR GEL, INTERMEDIATE FOR BLASTING EXPLOSIVES**


1
TEST SERIES 8
2
TEST 8 (a)
Thermal stability test
Is the substance thermally stable?
No
6
Classify as unstable explosive
Yes
3
TEST 8 (b)
ANE Large scale gap test
Is the substance too sensitive to shock to be accepted as an oxidizing liquid or an oxidizing solid?
Yes
7
Substance to be considered for classification as an explosive other than as an unstable explosive.
If the answer to the question "is it a very insensitive explosive substance with a mass explosion hazard?" in figure 10.3 is "no", the substance shall be classified in Division 1.1
No
4
TEST 8 (c)
Koenen test
Is the substance too sensitive to the effect of intensive heat under confinement?
Yes
8
Substance to be considered for classification as an explosive of Division 1.5, proceed with Test Series 5.
If the answer to the question "is it a very insensitive explosive substance with a mass explosion hazard?" in figure 10.3 is "yes", the substance shall be classified in Division 1.5;
If the answer is "no", the substance shall be classified in Division 1.1
5
No
ANE substance shall be classified as an oxidizing liquid or an oxidizing solid

"

Figure 10.5 Replace current figure with the following:


1
Each explosive substance in a Division 1.6 candidate article design
2
Is the substance in a main explosive load of a component within the article?
Yes
No
3
Is the substance in an isolated auxiliary explosive component of an article which when ignited or initiated does not cause any reaction of the main explosive loads?
Yes
No
4
Is the substance in a boostering component that exceeds a cross-sectional dimension of 50 mm or 5% volume when compared to its main explosive load?
Yes
No
5
Is the substance in a component of a fuze with two or more independent effective protective features or in a boostering component?
Yes
No
6
Undertake and meet acceptance criteria of explosive substance tests
Type 7 (c) (ii) and 7 (e)
7
Reject from Division 1.6
8
Type 7 (a) to 7 (f) testing not required
9
Undertake and meet acceptance criteria of extremely insensitive substance tests
Type 7 (a) to 7 (f)

10.4.2.3 In the first sentence:

- insert ", as appropriate," after "series 6 tests"
- Replace "behaviour of a product if a load is involved" with "behaviour of the explosive if it is involved"; and
- amend the text between parenthesis to read: "(boxes 32, 33, 34, 35, 36 and 37 of Figure 10.3)"

In the second sentence, replace:

- "a product" with "a substance of article in the transport configuration"; and
- "should be excluded from Class 1 (boxes 35 and 36 of Figure 10.3)" with "can be excluded from the class of explosives (boxes 38 and 39 of Figure 10.3)".

10.4.2.4 In the first sentence:

- delete "explosive" after "extremely insensitive"
- Replace "(box 40, Figure 10.3)" with "(box 23, Figure 10.3)"; and
- After "any candidate for Division 1.6", replace "should pass one of each" with "shall pass one of each"

For Type 7 (g), replace "as presented for transport" with "as presented for classification;"

10.4.2.5 In the first sentence, replace:

- "Is the substance a candidate" with "Is it a candidate"
- "emulsion or suspension" with "emulsion, suspension", and
- "(box 2 (a), Figure 10.2)" with "(box 3, Figure 10.2)"

Amend the end of the last sentence to read as follows: "...of ANEs for containment in portable tanks as oxidizing substances".

10.4.3.3 In the second sentence, replace "most disadvantageous" with "most severe". In the third sentence replace "are to be carried" with "are classified".

In (a), replace "by the competent authority" with ", where appropriate by the competent authority,".

10.4.3.4 In (a), replace:

- "articles are carried" with "articles are classified"; and
- "in the package (see also section 10.4.3.4 (d))" with "in the package (see also sub-paragraph 10.4.3.4 (d) below)".

In (b), amend the end of the first sentence to read "...each type of 6 (a) test (see also sub-paragraph 10.4.3.4 (d) below)".

In (b) (i) replace "detonation and/or ignition" with "initiation".

10.4.3.6 Replace "should be used" with "are used" and "establish that the explosive" with "establish that an explosive".

After "extremely insensitive" delete "detonating".

Replace "used to establish" with "are used to establish".

Insert "predominantly" before containing EIS(s)".

10.4.3.7 In the first sentence, replace "should be performed" with "are performed".

In the second sentence replace "for transport" with "for classification" and "the competent authority" with "the classifier".

Amend 10.4.3.7 (a) to read as follows: "Complex articles may contain multiple substances and test types 7 (a) to (f) shall be completed for all main explosive load and boostering component substances, as appropriate, within the article to be classified in Division 1.6."

In (b), delete the comma after "boostering" and replace "Box 3" with "Box 9" and "Box 24" with "Box 21".

In (c), replace "Box 4" with "Box 3"

In (d), replace "Box 6" with "Box 4", "Box 7" with "Box 6" and "Box 24" with "Box 21".

In (e), replace "Box 8" with "Box 5" and "Box 24" with "Box 21".

10.4.3.8 Amend the end of the first sentence to read: "may be accepted as an oxidizing solid or liquid".

In the second sentence, replace "Class 1" with "the class of explosives".

10.4.3.9 Delete the paragraph.

10.5.1 Replace "Class 1" with "the class of explosives" and amend the end of the paragraph to read as follows: "assignment procedures to "hexanitrostilbene (UN No.0392) and musk xylene (UN No. 2956), are given in figures 10.6 (a) to (d) and 10.7 (a) to (d)".

10.5.2 Replace "Figure 10.10" with "Figure 10.8".

Figure 10.6 Insert the following new Figures 10.6 (a) to 10.6 (d):

"**Figure 10.6 (a):**

**RESULTS FROM THE APPLICATION OF THE PROVISIONAL ACCEPTANCE PROCEDURE IN THE CLASS OF EXPLOSIVES (FIGURE 10.2) TO HEXANITROSTILBENE**

| | | |
|---|---|---|
| **1.** | **Name of substance**: | Hexanitrostilbene |
| **2.** | **General data** | |
| 2.1 | Composition: | hexanitrostilbene |
| 2.2 | Molecular formula: | $C_{14}H_6N_6O_{12}$ |
| 2.3 | Physical form: | powder |
| 2.4 | Colour: | yellow orange |
| 2.5 | Apparent density: | 1700 kg /m$^3$ |
| 2.6 | Particle size: | 0.1 – 0.3 mm |
| **3.** | **Box 2**: | Is the substance manufactured with the view to producing a practical explosive or pyrotechnic effect? |
| 3.1 | Answer: | Yes |
| 3.2 | Exit | Go to Box 10 |
| **4.** | **Box 10:** | **Substance to be considered in this class** |
| **5.** | **Box 11:** | Test Series 3 |
| 5.1 | Thermal stability: | 75 °C/48 hour test (test 3 (c)) |
| 5.2 | Sample conditions: | 100 g of substance at 75 °C |
| 5.3 | Observations: | No ignition, explosion, self-heating or visible decomposition |
| 5.4 | Result: | "-", thermally stable |

"**Figure 10.6 (a):**
**RESULTS FROM THE APPLICATION OF THE PROVISIONAL ACCEPTANCE PROCEDURE IN THE CLASS OF EXPLOSIVES (FIGURE 10.2) TO HEXANITROSTILBENE**

| | | |
|---|---|---|
| 5.5 | Impact sensitivity: | BAM fallhammer test (test 3 (a) (ii)) |
| 5.6 | Sample conditions: | as received |
| 5.7 | Observations: | Limiting impact energy 5 J |
| 5.8 | Result: | "-", not unstable in the form it was tested |
| 5.9 | Friction sensitivity: | BAM friction test (test 3 (b) (i)) |
| 5.10 | Sample conditions: | as received |
| 5.11 | Observations: | Limiting load > 240 N |
| 5.12 | Result: | "-", not unstable in the form it was tested |
| 5.13 | Ease of deflagration to detonation transition | Small scale burning test (test 3 (d)) |
| 5.14 | Sample conditions: | Ambient temperature |
| 5.15 | Observations: | Ignites and burns |
| 5.16 | Result: | "-", not unstable in the form it was tested |
| 5.17 | Exit: | Go to box 12 |
| | | |
| **6.** | **Box 12:** | Is it thermally stable? |
| 6.1 | Answer from test 3(c): | Yes |
| 6.2 | Exit: | Go to box 13 |
| | | |
| **7.** | **Box 13:** | Is it unstable in the form it was tested? |
| 7.1 | Answer from Test Series 3: | No |
| 7.2 | Exit: | Go to box 19 |
| | | |
| **8.** | **Conclusion:** | PROVISIONALLY ACCEPT INTO THIS CLASS |
| 8.1 | Exit: | Apply procedure for assignment to a division of the class of explosives |

**Figure 10.6 (b):**
**FLOW CHART FOR THE PROVISIONAL ACCEPTANCE OF HEXANITROSTILBENE IN THE CLASS OF EXPLOSIVES**

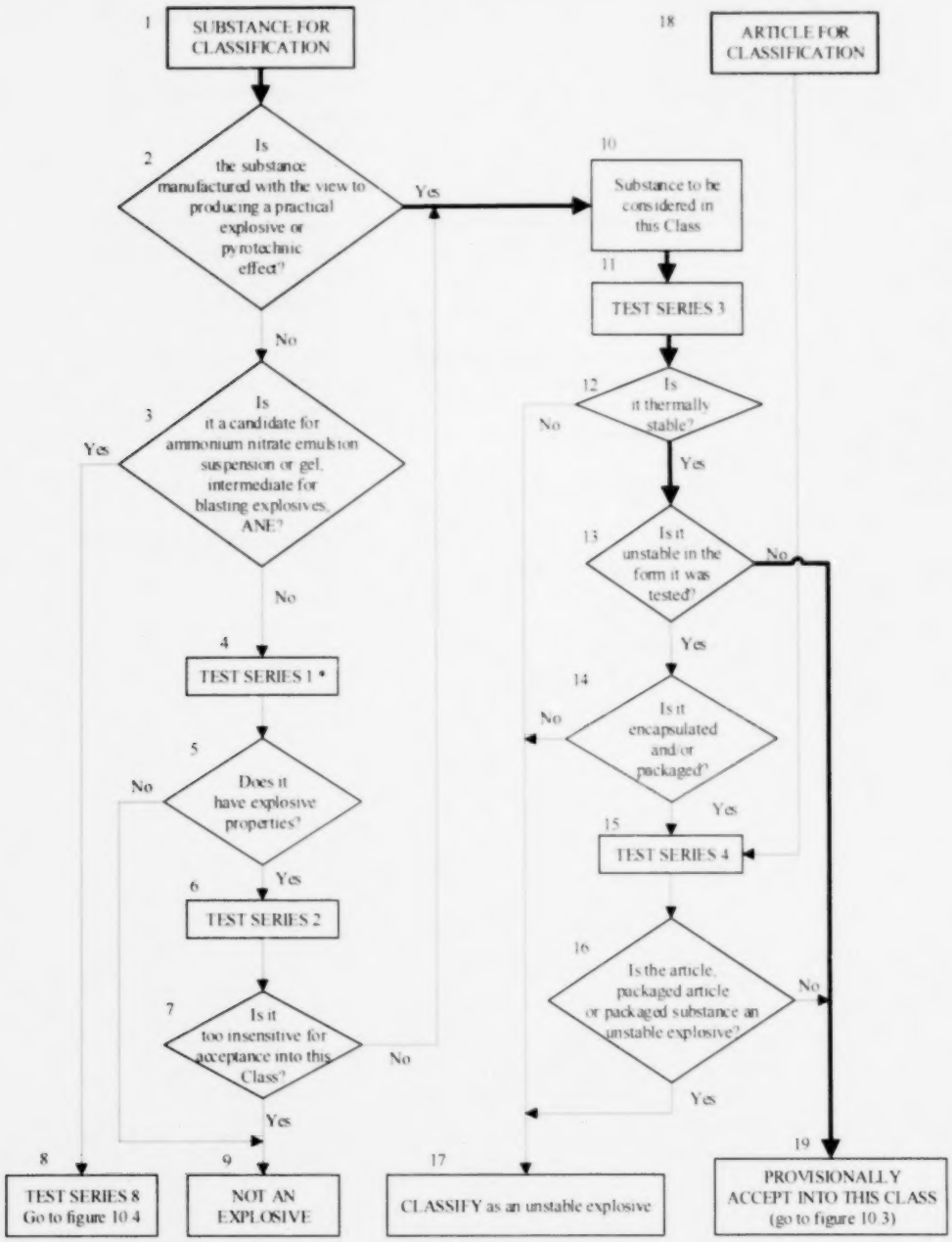


**Figure 10.6 (c):**
**RESULTS FROM APPLICATION OF THE PROCEDURE FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES (FIGURE 10.3) TO HEXANITROSTILBENE**

| | |
|---|---|
| **1.Box 26:** | Is the substance a candidate for Division 1.5? |
| 1.1 Answer: | No |
| 1.2 Result: | Package the substance (box 30) |
| 1.3 Exit: | Go to box 31 |
| **2. Box 31**: | Test Series 6 |
| 2.1 Effect of initiation in the package: | Test 6 (a) with detonator |
| 2.2 Sample conditions: | Ambient temperature, 50 kg fibreboard drum |
| 2.3 Observations: | Detonation, crater |
| 2.4 Result: | Mass explosion |
| 2.5 Effect of ignition between packages: | Test 6 (b) with detonator |
| 2.6 Sample conditions: | Ambient temperature, 3 fibreboard drums |
| 2.7 Observations: | Detonation, crater |
| 2.8 Result: | Mass explosion |
| 2.9 Effect of fire engulfment: | Test 6 (c) not required |
| **3. Box 32**: | Is the result a mass explosion? |
| 3.1 Answer from Test Series 6 | Yes |
| 3.2 Exit | Go to box 44 |
| **4. Conclusion** | Assign to Division 1.1 |

**Figure 10.6 (d):**
**FLOW CHART FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES OF HEXANITROSTILBENE**

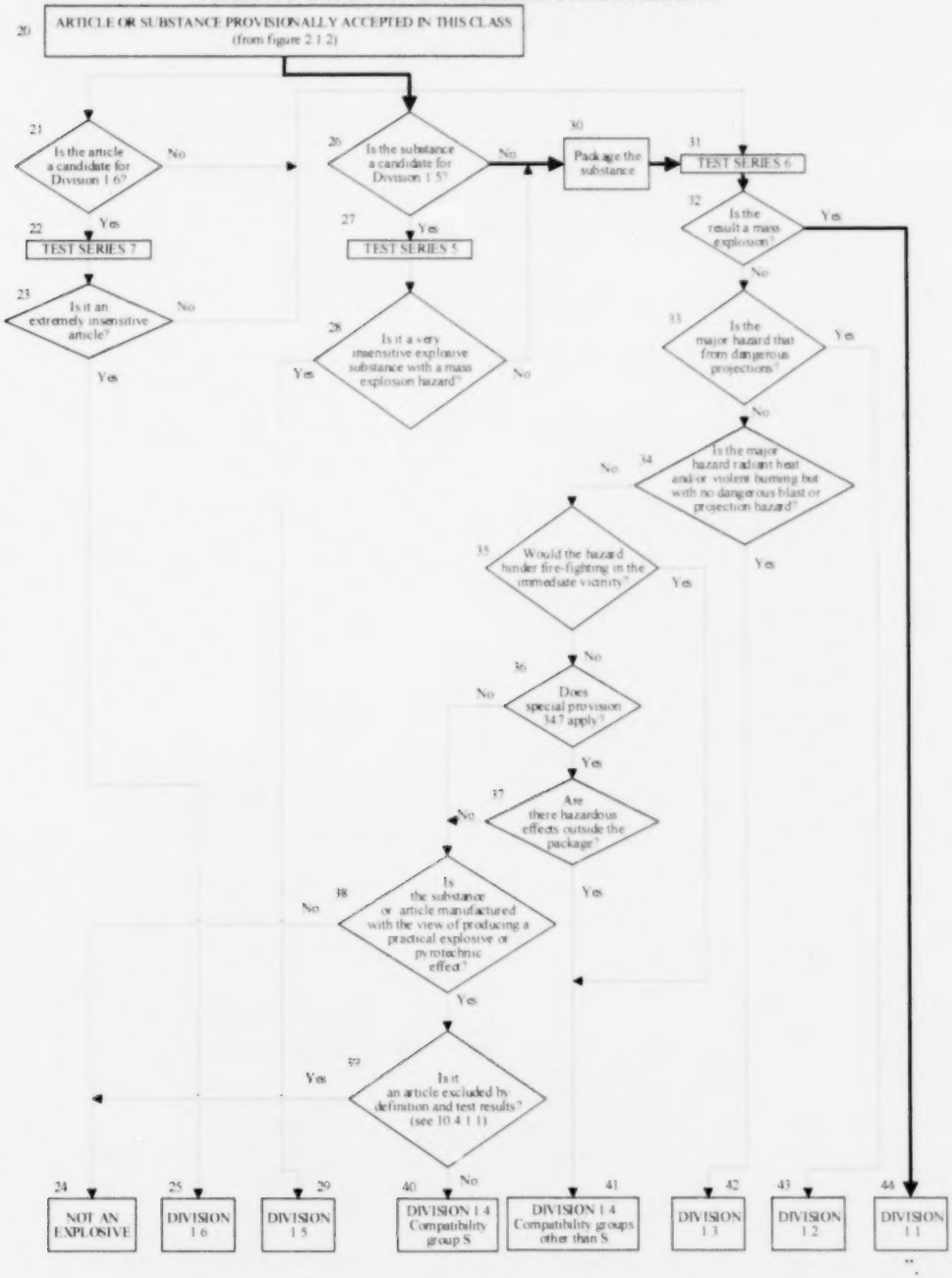

20 ARTICLE OR SUBSTANCE PROVISIONALLY ACCEPTED IN THIS CLASS (from figure 2.1.2)
21 Is the article a candidate for Division 1.6?
No
Yes
22 TEST SERIES 7
23 Is it an extremely insensitive article?
No
Yes
26 Is the substance a candidate for Division 1.5?
No
Yes
27 TEST SERIES 5
28 Is it a very insensitive explosive substance with a mass explosion hazard?
Yes
No
30 Package the substance
31 TEST SERIES 6
32 Is the result a mass explosion?
Yes
No
33 Is the major hazard that from dangerous projections?
Yes
No
34 Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard?
No
Yes
35 Would the hazard hinder fire-fighting in the immediate vicinity?
Yes
No
36 Does special provision 347 apply?
No
Yes
37 Are there hazardous effects outside the package?
No
Yes
38 Is the substance or article manufactured with the view of producing a practical explosive or pyrotechnic effect?
No
Yes
39 Is it an article excluded by definition and test results? (see 10.4.1.1)
Yes
No
24 NOT AN EXPLOSIVE
25 DIVISION 1.6
29 DIVISION 1.5
40 DIVISION 1.4 Compatibility group S
41 DIVISION 1.4 Compatibility groups other than S
42 DIVISION 1.3
43 DIVISION 1.2
44 DIVISION 1.1

Figure 10.7 (a) Current Figure 10.6 becomes Figure 10.7(a), as amended to read as follows:

**"Figure 10.7 (a):**
**RESULTS FROM THE APPLICATION OF THE PROVISIONAL ACCEPTANCE PROCEDURE IN THE CLASS OF EXPLOSIVES (FIGURE 10.2) TO MUSK XYLENE**

| | | |
|---|---|---|
| **1.** | **Name of substance**: | 5-tert-BUTYL-2,4,6-TRINITRO-m-XYLENE (MUSK XYLENE) |
| **2.** | **General data** | |
| 2.1 | Composition: | 99% tert-butyl-2,4,6-trinitro-m-xylene |
| 2.2 | Molecular formula: | $C_{12}H_{15}N_3O_6$ |
| 2.3 | Physical form: | Fine crystalline powder |
| 2.4 | Colour: | Pale yellow |
| 2.5 | Apparent density: | 840 kg /m$^3$ |
| 2.6 | Particle size: | < 1.7 mm |
| **3.** | **Box 2**: | Is the substance manufactured with the view to producing a practical explosive or pyrotechnic effect? |
| 3.1 | Answer: | No |
| 3.2 | Exit | Go to Box 3 |
| **4.** | **Box 3:** | Is it a candidate for ammonium nitrate emulsion, suspension or gel, intermediate for blasting explosives, ANE? |
| 4.1 | Answer: | No |
| 4.2 | Exit: | Go to Box 4 |
| **5.** | **Box 4:** | Test Series 1 |
| 5.1 | Propagation of detonation: | UN gap test (test 1(a)) |
| 5.2 | Sample conditions: | Ambient temperature |
| 5.3 | Observations: | Fragmentation length 40 cm |
| 5.4 | Result: | "+", propagation of detonation |
| 5.5 | Effect of heating under confinement: | Koenen test (test 1(b)) |
| 5.6 | Sample conditions: | Mass 22.6 g |
| 5.7 | Observations: | Limiting diameter 5.0 mm<br>Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s) |
| 5.8 | Result: | "+", shows some explosive effects on heating under confinement |
| 5.9 | Effect of ignition under confinement: | Time/pressure test (test 1 (c) (i)) |
| 5.10 | Sample conditions: | Ambient temperature |
| 5.11 | Observations: | No ignition |
| 5.12 | Result: | "-", no effect on ignition under confinement |
| 5.13 | Exit: | Go to Box **5** |
| **6.** | **Box 5** | Does it have explosive properties? |

**"Figure 10.7 (a):**
**RESULTS FROM THE APPLICATION OF THE PROVISIONAL ACCEPTANCE PROCEDURE IN THE CLASS OF EXPLOSIVES (FIGURE 10.2) TO MUSK XYLENE**

| | | |
|---|---|---|
| 6.1 | Answer from Test Series 1: | Yes |
| 6.2 | Exit: | Go to box 6 |
| | | |
| 7. | **Box 6** | Test Series 2 |
| 7.1 | Sensitivity to shock: | UN gap test (test 2(a)) |
| 7.2 | Sample conditions: | Ambient temperature |
| 7.3 | Observations: | No propagation |
| 7.4 | Result: | "-", not sensitive to shock |
| 7.5 | Effect of heating under confinement: | Koenen test (test 2(b)) |
| 7.6 | Sample conditions: | Mass 22.6 g |
| 7.7 | Observations: | Limiting diameter 5.0 mm<br>Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s) |
| 7.8 | Result: | "+", violent effect on heating under confinement |
| 7.9 | Effect of ignition under confinement | Time/pressure test (test 2 (c) (i)) |
| 7.10 | Sample conditions: | Ambient temperature |
| 7.11 | Observations: | No ignition |
| 7.12 | Result: | "-", no effect on ignition under confinement |
| 7.13 | Exit: | Go to Box 7 |
| | | |
| 8. | **Box 7:** | Is it too insensitive for acceptance into this class? |
| 8.1 | Answer from Test Series 2: | No |
| 8.2 | Conclusion | Substance to be considered in this Class (box 10) |
| 8.3 | Exit: | Go to Box 11 |
| | | |
| 9. | Box 11: | Test Series 3 |
| 9.1 | Thermal stability: | 75 °C/48 hour test (test 3 (c)) |
| 9.2 | Sample conditions: | 100 g of substance at 75 °C |
| 9.3 | Observations: | No ignition, explosion, self-heating or visible decomposition |
| 9.4 | Result: | "-", thermally stable |
| 9.5 | Impact sensitivity: | BAM fallhammer test (test 3 (a) (ii)) |
| 9.6 | Sample conditions: | as received |
| 9.7 | Observations: | Limiting impact energy 25 J |
| 9.8 | Result: | "-", not unstable in the form it was tested |
| 9.9 | Friction sensitivity: | BAM friction test (test 3 (b) (i)) |
| 9.10 | Sample conditions: | as received |
| 9.11 | Observations: | Limiting load > 360 N |
| 9.12 | Result: | "-", not unstable in the form it was tested |

**"Figure 10.7 (a):**
**RESULTS FROM THE APPLICATION OF THE PROVISIONAL ACCEPTANCE PROCEDURE IN THE CLASS OF EXPLOSIVES (FIGURE 10.2) TO MUSK XYLENE**

| | | |
|---|---|---|
| 9.13 | Ease of deflagration to detonation transition | Small scale burning test (test 3 (d)) |
| 9.14 | Sample conditions: | Ambient temperature |
| 9.15 | Observations: | Ignites and burns slowly |
| 9.16 | Result: | "-", not unstable in the form it was tested |
| 9.17 | Exit: | Go to box 12 |
| | | |
| **10.** | **Box 12:** | |
| 6.1 | Answer from test 3(c): | Yes |
| 6.2 | Exit: | Go to box 13 |
| | | |
| **11.** | **Box 13:** | Is it unstable in the form it was tested? |
| 11.1 | Answer from Test Series | No |
| 11.2 | Exit: | Go to box 19 |
| | | |
| **12.** | **Conclusion:** | PROVISIONALLY ACCEPT INTO THIS CLASS |
| 12.1 | Exit: | Apply procedure for assignment to a division of the class of explosives |

"

Figure 10.7 (b) Renumber current Figure 10.7 as 10.7 (b) as amended to read as follows:

**"Figure 10.7 (b):**
**FLOW CHART FOR THE PROVISIONAL ACCEPTANCE OF MUSK XYLENE IN THE CLASS OF EXPLOSIVES**

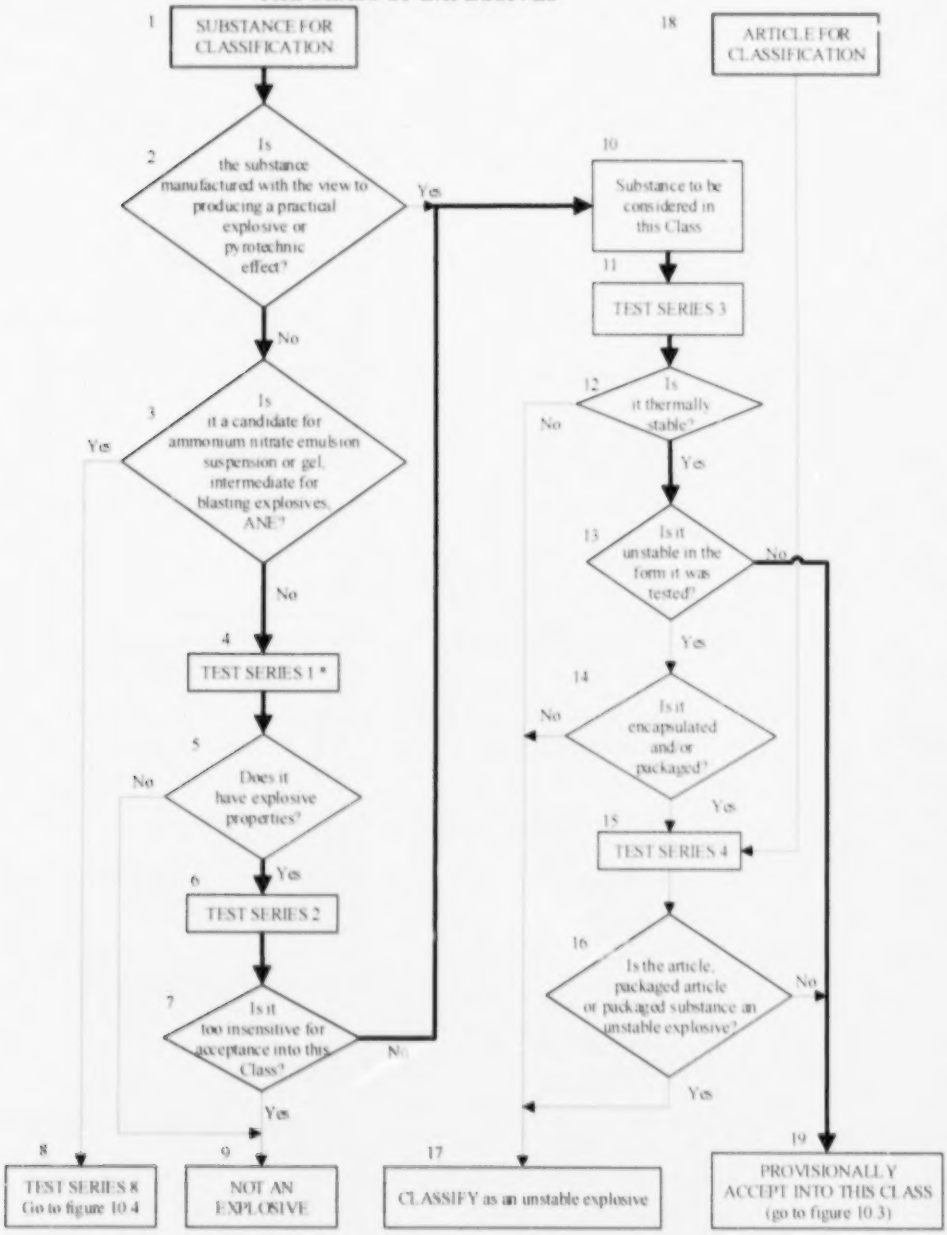


Figure 10.7 (c) Renumber current figure 10.8 as 10.7(c) and amend to read follows:

**"Figure 10.7 (c):**
**RESULTS FROM APPLICATION OF THE PROCEDURE FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES (FIGURE 10.3) OF MUSK XYLENE**

| | |
|---|---|
| **1. Box 26:** | Is the substance a candidate for Division 1.5? |
| 1.1 Answer: | No |
| 1.2 Result: | Package the substance (box 30) |
| 1.3 Exit: | Go to box 31 |
| **2. Box 31:** | Test Series 6 |
| 2.1 Effect of initiation in the package: | Test 6 (a) with detonator |
| 2.2 Sample conditions: | Ambient temperature, 50 kg fibreboard drum |
| 2.3 Observations: | Only localised decomposition around detonator |
| 2.4 Result: | No significant reaction |
| 2.5 Effect on ignition in the package | Test 6 (a) with igniter |
| 2.6 Sample conditions: | Ambient temperature, 50 Kg fibreboard drum |
| 2.7 Observations: | Only localised decomposition around igniter |
| 2.8 Result: | No significant reaction |
| 2.9 Effect of propagation: | Type 6 (b) test not required as no effect outside package between packages in 6 (a) test |
| 2.10 Effect of fire engulfment | Test 6 (c) |
| 2.11 Sample conditions: | 3 × 50 kg fibreboard drums mounted on steel frame above wooden crib fire |
| 2.12 Observations: | Only show burning with black smoke occurred |
| 2.13 Result: | No effects which would hinder fire fighting |
| 2.14 Exit: | Go to box 32 |
| **3. Box 32** | **Is the result a mass explosion?** |
| 3.1 Answer from Test Series 6: | No |
| 3.2 Exit: | Go to box 34 |
| 4. Box 33: | Is the major hazard that from dangerous projections? |
| 4.1 Answer from Test Series 6: | No |
| 4.2 Exit: | Go to box 34 |

"**Figure 10.7 (c):**
**RESULTS FROM APPLICATION OF THE PROCEDURE FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES (FIGURE 10.3) OF MUSK XYLENE**

| | |
|---|---|
| **5. Box 34:** | Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard? |
| 5.1 Answer from Tests Series 6 | No |
| 5.2 Exit | Go to box 35 |
| **6. Box 35** | Would the hazard hinder fire-fighting in the immediate vicinity? |
| 6.1 Answer from Test Series 6: | No |
| 6.2 Exit: | Go to box 36 |
| **7. Box 36** | Does special provision 347 apply? |
| 7.1 Answer: | No |
| 7.2 Exit: | Go to box 38 |
| **8. Box 38** | Is the substance or article manufactured with the view of producing a practical explosive or pyrotechnic effect? |
| 8.1 Answer: | No |
| 8.2 Exit: | Go to box 24 |
| **9. Conclusion:** | **NOT AN EXPLOSIVE** |
| 9.1 Exit: | Consider for another class/division |

Figure 10.7 (d) Renumber current Figure 10.9 as 10.7(d), and amend to read as follows.

"

**"Figure 10.7 (d): PROCEDURE FOR EXEMPTION OF MUSK XYLENE FROM THE CLASS OF EXPLOSIVES**

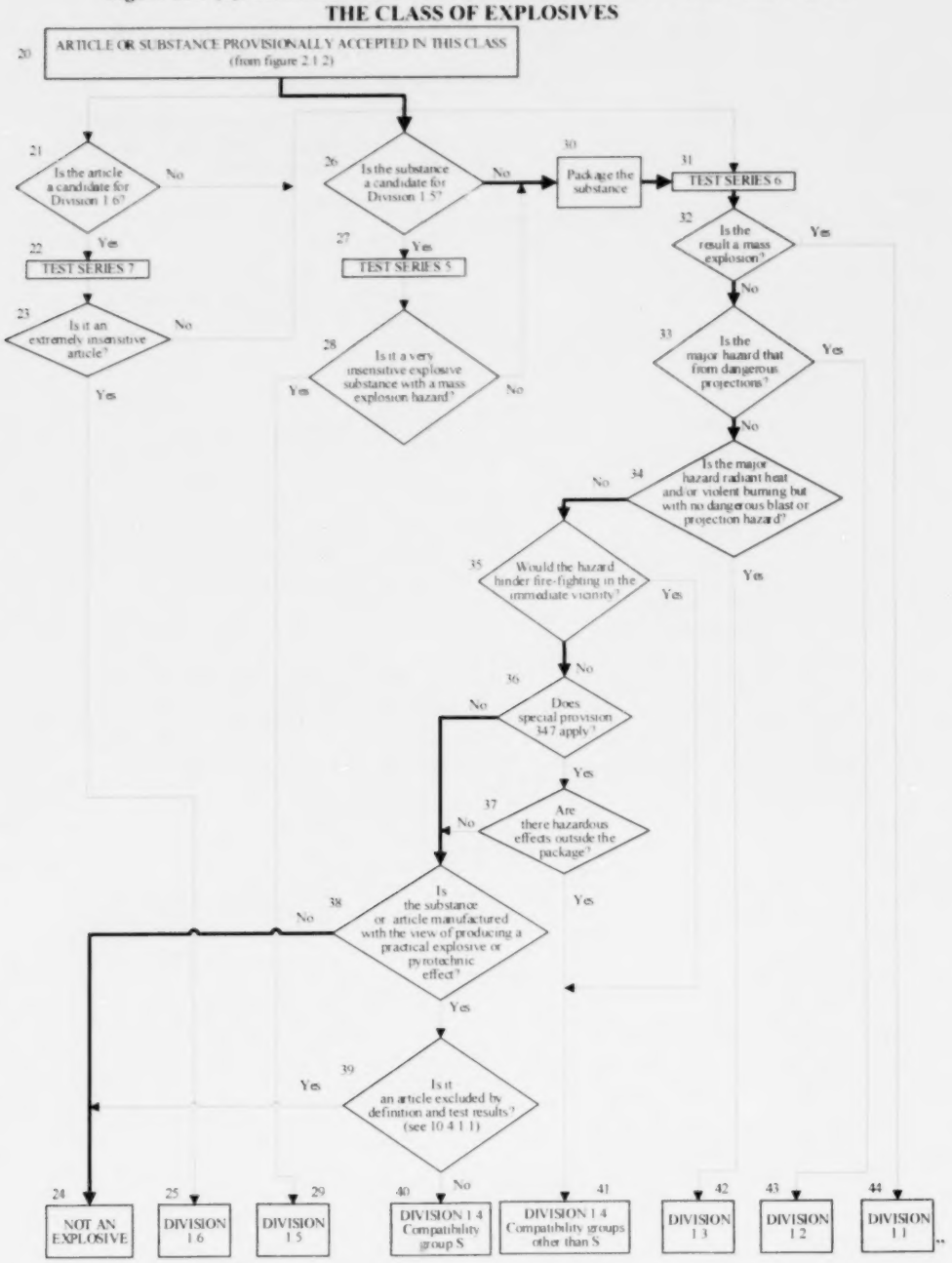



Figure 10.8 Current Figure 10.10 becomes Figure 10.8.